

2.1 Conditional Statements

- Goals**
- Recognize and analyze a conditional statement.
 - Write postulates about points, lines, and planes using conditional statements.

VOCABULARY

Conditional statement

If-then form

Hypothesis

Conclusion

Converse

Negation

Inverse

Contrapositive

Equivalent statements

Example 1 *Rewriting in If-Then Form*

Rewrite the conditional statement in *if-then* form.

- a. Three points are coplanar if they lie on the same plane.
- b. Water freezes at temperatures below 32°F .
- c. An even number is divisible by 2.

Solution

- a. If _____, then _____.
- b. If _____, then _____.
- c. If _____, then _____.

Example 2 *Writing an Inverse, Converse, and Contrapositive*

Write the (a) inverse, (b) converse, and (c) contrapositive of the following statement.

If the sun is shining, then we are not watching TV.

Solution

- ~~a. Inverse:~~ _____.
- b. Converse: _____.
- ~~c. Contrapositive:~~ _____.

✓ **Checkpoint** Write the ~~(a) inverse, (b) converse, and (c) contrapositive of the conditional statement.~~

1. If my allowance increases, then I can save more money.

POINT, LINE, AND PLANE POSTULATES

Postulate 5 Through any two points there exists exactly one _____.

Postulate 6 A line contains at least two _____.

Postulate 7 If two lines intersect, then their intersection is _____.

Postulate 8 Through any three _____ points there exists exactly one plane.

Postulate 9 A plane contains at least three _____ points.

Postulate 10 If two points lie in a plane, then the line containing them _____.

Postulate 11 If two planes intersect, then their intersection is a _____.

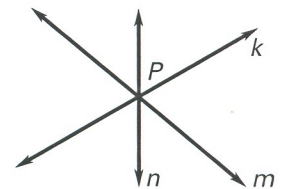
Example 3 *Using Postulates and Counterexamples*

Decide whether the statement is *true* or *false*. If it is false, give a counterexample.

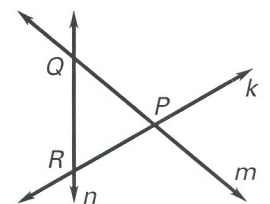
- A point can lie on more than two lines.
- Three lines can intersect at no more than three distinct points.
- If two lines are coplanar, then they intersect.

Solution

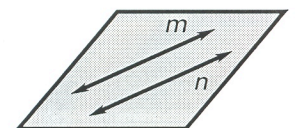
- a. In the diagram at the right, point P is the _____ of line k , line m , and line n . So, it is _____ that a point can lie on more than two lines.



- b. In the diagram at the right, line k and line m intersect at point _____, line _____ and line _____ intersect at point Q , and line _____ and line n intersect at point _____. There are no more possible intersections. So, it is _____ that three lines can intersect at no more than three distinct points.



- c. In the diagram at the right, line m and line n are _____, but they do not _____. So, it is _____ that if two lines are coplanar, then they intersect.



Study Guide

2.1 Blue Book

Conditional Statements and Their Converses

If-then statements are commonly used in everyday life. For example, an advertisement might say, "If you buy our product, then you will be happy." Notice that an if-then statement has two parts, a *hypothesis* (the part following "if") and a *conclusion* (the part following "then").

New statements can be formed from the original statement.

Statement $p \rightarrow q$

Converse $q \rightarrow p$

Example: Rewrite the following statement in if-then form. Then write the converse, inverse, and contrapositive.

All elephants are mammals.

If-then form: If an animal is an elephant, then it is a mammal.

Converse: If an animal is a mammal, then it is an elephant.

Identify the hypothesis and conclusion of each conditional statement.

1. If today is Monday, then tomorrow is Tuesday.
2. If a truck weighs 2 tons, then it weighs 4000 pounds.

Write each conditional statement in if-then form.

3. All chimpanzees love bananas.
4. Collinear points lie on the same line.

Write the converse of each conditional.

5. If an animal is a fish, then it can swim.
6. All right angles are congruent.

Conditional Statements and Their Converses

Identify the hypothesis and the conclusion of each statement.

1. If you purchase a computer and do not like it, then you can return it within 30 days.
2. If $x + 8 = 15$, then $x = 7$
3. If the drama club raises \$2000, then they will go on tour.
4. If the temperature today is 80° or more, then you will go swimming.
5. If two lines intersect, then the intersection is a point.

Write two other forms of each statement.

6. If two planes intersect, then the intersection is a line.
7. If it snows, then you will go sledding.
8. Your dog will be happy if you feed him Doggy Chow.
9. Hiking will be easier if you have hiking boots.
10. All squares have four sides of equal length and four right angles..

Write the converse of each statement.

11. If a figure is a triangle, then it has three sides.
12. If you find a penny, then you will have good luck.
13. If you ride your bicycle recklessly, then you can get hurt.
14. If two distinct lines intersect, then their intersection is one point.
15. If your cat purrs, then it is contented.

Practice A

For use with pages 71–78

Identify the hypothesis and the conclusion.

1. If the weather is warm, then we should go swimming.
2. If you want good service, then take your car to Joe's Service Center.
3. If you like purple, you'll love this sweater.
4. $2x - 12 = 40$ only if $x = 26$.
5. If the groundhog sees its shadow, then there will be six more weeks of winter.

Rewrite the conditional statement in if-then form.

6. Today is Monday if yesterday was Sunday.
7. An object measures 12 inches if it is one foot long.
8. A number is divisible by 4 if it is divisible by 8.
9. An acute angle is an angle that measures less than 90° .
10. Geometry is offered only during periods 2 and 4.

Decide whether the statement is *true* or *false*. If false, provide a counterexample.

11. The equation $2x - 7 = 5 + x$ has exactly one solution.
12. If $x^2 = 16$, then x must equal 8 or -8 .
13. February 14 is Valentine's Day.
14. If you visited the Statue of Liberty, then you've been to New York.
15. A point may lie on at most two lines.

Write the converse and contrapositive of each statement.

16. If you like tennis, then you play on the tennis team.
17. If x is odd, then $2x$ is even.
18. If $m\angle P = 45^\circ$, then $\angle P$ is acute.

Use the diagram to state the postulate(s) that verifies the truth of the statement.

19. The points X , Y , and Z lie in a plane (labeled B).
20. The points X and Y lie on a line (labeled m).
21. The planes A and B intersect in a line (labeled l).
22. The points X and Y lie in a plane B . Therefore, line m lies in plane B .

